3.2 VACCINATION FOR INTERNATIONAL TRAVEL

3.2.1 Introduction

The number of Australians who travel overseas has increased over recent years. Data available through the Australian Bureau of Statistics suggest that there were about 6.7 million short-term departures in 2010, with more than half travelling to destinations other than New Zealand or countries in North America and Europe.[1] There are various risks to health associated with international travel, including exposures to infective agents, extremes of altitude and temperature, and other physical, psychological and environmental hazards. There could also be poor quality or limited access to clean water, shelter, hygiene and sanitation facilities, and health and medical care. The level of health risks will vary with individual factors, including the travellers' underlying health and physiological state, the itinerary and activities undertaken, and the duration of exposure to various hazards during travel.

Travellers with increased risks to their health include young children and infants; pregnant women; people with underlying medical conditions, especially immunocompromising conditions due to disease or medical treatment; travellers spending extended periods in multiple regions with poor resources or in remote regions; those participating in mass gatherings (major sporting, cultural, social or religious events involving large numbers of people); and migrant families travelling back to their country/region of origin to visit friends and relatives (VFR). Those undertaking VFR travel are more likely to have closer contact with local populations, stay in remote or rural areas, and consume higher-risk food and beverages. They are also less likely to adequately perceive health risks associated with travelling, specifically seek pre-travel health advice, or be adequately vaccinated or prophylaxed.[2,3]

3.2.2 Infections acquired by travellers

Exposure to infectious diseases, some of which are vaccine preventable, is one of the many health hazards of international travel. Although some of these diseases are present in Australia, the risk of acquiring them overseas may be higher because of higher disease incidence in other countries and/or increased risk of exposure resulting from activities undertaken during the travel period.

Common infections acquired by travellers include those that follow ingestion of contaminated food or beverages.[4,5] Most of these are diarrhoeal diseases due to enteric pathogens, but infections with extra-intestinal manifestations, such as hepatitis A and typhoid, are also acquired this way. Vaccines against hepatitis A, typhoid and cholera are available.

Insect-borne (particularly mosquito-borne) infections, such as malaria and dengue, are important causes of fever in Australian travellers returning from endemic areas, particularly Southeast Asia and Oceania.[5] Japanese encephalitis occurs throughout a large part of Asia and the Western Pacific region, including eastern Indonesia and Papua New Guinea. Yellow fever occurs only in parts of Africa and South America, while tick-borne encephalitis occurs in parts of Europe and Asia. Vaccines are available for protection against Japanese encephalitis, yellow fever and tick-borne encephalitis.

Vaccine-preventable infections transmitted via aerosols and/or droplets include influenza, meningococcal disease, measles, mumps and varicella (chickenpox); influenza is typically the most frequent vaccine-preventable infection among travellers.[6] Incidences of measles and mumps are higher in many overseas countries, including some developed countries, than in Australia. Tuberculosis is a rare infection in travellers, and is more likely to be acquired by expatriates who live in endemic areas for long periods than by short-term visitors.

Blood-borne and sexually transmitted infections, such as hepatitis B, hepatitis C and human immunodeficiency virus (HIV), may pose a threat to some Australian travellers. In some areas, there is the possibility that these viruses and other blood-borne agents may be transmitted by healthcare workers using non-sterile medical equipment or other poor infection control practices. Hepatitis B vaccine is relevant to many travellers.

Travellers may be exposed to a variety of other exotic infectious agents, such as rabies (from bites or scratches from rabid dogs and other mammals in many countries), schistosomiasis (from exposure to water infested with the parasites, in Africa in particular), and leptospirosis (through activities like rafting or wading in contaminated streams). Of these, only rabies can be prevented by vaccination.

Some other vector-borne diseases and parasitic (including protozoal and helminthic) diseases are also important for international travellers, some of which are preventable through appropriate barrier precautions and chemoprophylaxis (e.g. malaria).

3.2.3 Practical aspects of recommending vaccinations for travellers

Although important, recommending appropriate vaccinations is not the only component of a pre-travel medical consultation, and vaccines relevant for travelling are not restricted to those for prevention of diseases that occur most commonly overseas ('travel vaccines'). Recommendation of a vaccine for travelling only on the basis of the destination country is undesirable. There is no single 'correct' list of vaccines for travelling to any single country.

In a pre-travel medical consultation, it is prudent to also acquire adequate information regarding:

- relevant personal information of the traveller, including age, pregnancy or planning of pregnancy, or even possible financial constraints
- underlying medical conditions of the traveller, particularly immunocompromising conditions, and current medications
- vaccination history (including adverse events following immunisation) and allergy history of the traveller
- detailed intended itinerary, including date of departure (and time period available for vaccinations), specific localities and routes, rural versus urban stay, duration of stay, likely access to healthcare and other services, and probability of deviation from planned itinerary
- purpose(s) of travel and intended activities, especially those susceptible to various environmental risks and hazards
- plans for travel insurance.

This information will not only facilitate recommendations of preventive vaccinations and/or chemoprophylaxis that are commensurate with exposure risks and tailored to the proposed trip, but also provision of other important preventive health advice (e.g. food and water precautions, avoidance of bites from mosquitoes or other arthropods) and advice regarding management of possible health conditions during travel.

Some overseas organisations, such as schools, colleges and universities, have policies requiring evidence of vaccination and/or immunity against some vaccine-preventable diseases, for example, measles and meningococcal disease. These requirements should be taken into account while planning and scheduling immunisation prior to departure.

The vaccination needs for a traveller may be conveniently considered in several categories.

Routinely recommended vaccines (not specifically related to travelling overseas)

All travellers should be up to date with current standard vaccination recommendations. Consideration should also be given to any other vaccines that may be relevant to the individual's health status or underlying medical conditions, occupation or lifestyle (e.g. pneumococcal polysaccharide vaccine for an elderly person or person otherwise recommended to have had pneumococcal vaccine, hepatitis B vaccine for a first aid officer). The probability of exposure to some of these diseases may be greater while travelling overseas, even to 'developed' countries (e.g. measles and mumps). For some itineraries, it may be appropriate for some booster doses to be received sooner (i.e. before travel) than at the routine recommended time (e.g. diphtheria-tetanus booster).

Selected vaccines based on travel itinerary, activities and likely risk of disease exposure

A risk assessment approach should be adopted in recommending some selective vaccines based on travel itineraries ('travel vaccines'). Potential risks of disease exposure and protective benefits from vaccinations should be weighed against potential adverse effects and both non-financial and financial costs arising from vaccinations. Priority should be given to vaccines for diseases that are common and of significant impact (e.g. influenza and hepatitis A), and to those diseases that, although less common, have severe potential adverse outcomes (e.g. Japanese encephalitis and rabies). Booster doses should be considered where appropriate (refer to Table 3.2.1). Because of the imminence of departure, sometimes an 'accelerated schedule' may be considered appropriate (e.g. for hepatitis B or the combined hepatitis A/hepatitis B vaccine – refer to the relevant disease-specific chapters in Part 4). Note that, while immunity may be established sooner with the accelerated schedule, an additional dose is required about a year later for completion of the course to augment long-term protection. For children, the lower age limits for recommendation of selected vaccines should be noted (refer to Table 3.2.2).

Vaccines required by International Health Regulations or for entry into specific countries

Yellow fever vaccination is required by the International Health Regulations (2005) for travelling in certain circumstances, for the purpose of individual protection if a traveller is likely to be exposed to yellow fever and/or for protection of vulnerable populations (in countries with relevant vectors) from importation of the disease (refer to 4.23 *Yellow fever*). Some countries, including those without current disease transmission such as Australia, may require documented evidence of yellow fever vaccination as a condition of entry or exit (refer to 'Vaccine administration and documentation' below). For Australia's yellow fever travel requirements, refer to the Australian Government Department of Health's yellow fever fact sheet (www.health.gov.au/yellowfever). Entry requirements for yellow fever vaccination for the countries a traveller intends to enter or transit through can be confirmed by contacting the country's foreign missions in Australia.

Vaccination requirements for other vaccine-preventable diseases, such as polio, may be temporarily introduced under the International Health Regulations in response to changes in disease epidemiology that are of international health concern. As country vaccination requirements are subject to change at any time, it is important that current vaccination requirements for the countries a traveller intends to enter or transit through are confirmed prior to travel (refer to 3.2.6 *Further information* below).

The Ministry of Health of Saudi Arabia annually issues specific requirements and recommendations for entry visas for travellers on pilgrimage to Mecca in Saudi Arabia (Hajj and Umra). For pilgrims travelling directly from Australia, only evidence of quadrivalent meningococcal vaccination is currently mandatory. However, current requirements should be referred to when advising prospective Hajj and Umra pilgrims (refer to 3.2.6 *Further information* below).

Vaccine administration and documentation

It is not unusual that multiple vaccines would be required before travelling. The standard recommendations and precautions for administration of multiple vaccines are applicable (refer to 2.2 *Administration of vaccines*).

Multiple clinic visits may be necessary when multiple vaccines and vaccines that involve multiple doses are involved (e.g. rabies pre-exposure prophylaxis or hepatitis B vaccine). Special attention should be paid to the appropriate scheduling of these visits, taking into account dose interval precautions (e.g. multiple live vaccines), requirement for pre-vaccination tests (e.g. tuberculin skin test), and potential interference by some antimalarials if relevant (e.g. rabies vaccine). Ideally, vaccination courses should be started early enough before departure to allow for the period when most adverse events are expected to occur and to allow sufficient time for adequate immunity to develop.

It is important to document travel vaccines appropriately, not only in the clinic's record but also in a suitable record that can be carried by the traveller. It is recommended that the record also includes all the other 'routinely recommended' vaccines that the traveller has ever received.

An International Certificate of Vaccination or Prophylaxis (ICVP), which can only be provided at Yellow Fever Vaccination Centres in accordance with the International Health Regulations (2005), is required for yellow fever vaccination (refer to 4.23 *Yellow fever*). An ICVP may be required for other vaccine-preventable diseases, such as polio, in accordance with temporarily introduced recommendations under the International Health Regulations in response to changes in disease epidemiology which are of international concern. Up-to-date information is available from the sources listed in 3.2.6 *Further information* below.

3.2.4 Vaccines

Detailed information regarding each of the vaccines discussed below is provided in each of the corresponding disease-specific chapters of this *Handbook*. This section provides some general guidance in considering whether a particular vaccine may be advisable for a traveller.

All prospective travellers should have been vaccinated according to the recommended vaccination schedule appropriate for the traveller's age and underlying health conditions. All children should be vaccinated according to the NIP schedule. In exceptional circumstances, the NIP vaccines may be administered at the minimum age rather than the recommended age (refer to 2.1.5 *Catch-up*, Table 2.1.5 *Minimum acceptable age for the 1st dose of scheduled vaccines in infants in special circumstances*). Children vaccinated using the minimum age rather than the recommended age may require extra vaccine doses to ensure adequate protection. The minimum interval requirements between doses must be observed (refer to 2.1.5 *Catch-up*, Table 2.1.7 *Minimum acceptable dose intervals for children <10 years of age*).

Routinely recommended vaccines (not specifically related to travelling overseas)

Diphtheria, tetanus and pertussis

Adult travellers should be adequately protected against tetanus before departure, particularly if their risk of sustaining tetanus-prone wounds is high or there could be delays in accessing health services where they can receive tetanus toxoid boosters safely if required. Protection against pertussis should also be offered at this opportunity (as dTpa) if no previous dose of dTpa has been given (refer to 4.12 *Pertussis*). Before departure, adults should be given a booster dose of dT, if more than 10 years have elapsed since the last dose, or dTpa if not given previously. For high-risk trips, consider giving a booster of either dTpa or dT if more than 5 years have elapsed (refer to 4.19 *Tetanus*).

Hepatitis B

Most Australian children born since 2000, and a high proportion of adolescents, will have been vaccinated against hepatitis B under the NIP or jurisdictional school-based vaccination programs. Long-term or frequent travellers to regions of intermediate or high endemicity of hepatitis B, including Central and South America, Africa, Asia or Oceania, are recommended to be vaccinated against hepatitis B, due to the potential for inadvertent exposure to hepatitis B virus through blood-borne or sexual routes, including unplanned medical or dental procedures. A survey has shown that about half of Australian travellers who spent at least 3 nights in Southeast or East Asia had participated in at least one activity with a risk of acquiring hepatitis B.[7] (Refer also to 4.5 *Hepatitis B*.)

Influenza and pneumococcal disease

Older travellers (usually those aged ≥65 years) and those with any relevant underlying medical or behavioural risk factors (refer to 4.7 *Influenza* and 4.13 *Pneumococcal disease*) should receive the seasonal influenza vaccine and/or should have received the 23-valent pneumococcal polysaccharide vaccine. All travellers should consider influenza vaccine, especially if travelling during the influenza season of the destination region(s). The influenza vaccine is particularly relevant if influenza epidemics are occurring at the traveller's destination(s), and for travellers in large

tourist groups, especially those that include older persons, or travelling on cruises, where they are likely to be in confined circumstances for days to weeks (refer to 4.7 *Influenza*).

Measles, mumps, rubella and varicella

Most measles outbreaks in Australia now result from an infection imported by inadequately vaccinated young travellers. Incidences of measles and mumps are higher in some overseas countries, regions or communities, including developed countries, than in Australia. Australians born during or since 1966 who have not received 2 doses of measles-, mumps- and rubella-containing vaccines should be vaccinated with the MMR vaccine before travelling (noting pregnancy precautions) (refer to 4.9 *Measles*). Varicella vaccine should be offered to unvaccinated travellers who have not had clinical disease, or where serology demonstrates lack of immunity in those with an uncertain history of clinical disease (refer to 4.22 *Varicella*).

Meningococcal disease

A single dose of MenCCV-containing vaccine is recommended for all children at the age of 12 months (refer to 4.10 *Meningococcal disease*). This can be provided as either the combination vaccine Hib-MenCCV or MenCCV. Vaccination against meningococcal serogroup B is recommended for certain age groups who are at increased risk of meningococcal disease (refer to 4.10 *Meningococcal disease*).

Poliomyelitis

All travellers should be age-appropriately immunised against polio (refer to 4.14 *Poliomyelitis*). If travelling to countries where wild poliovirus transmission still occurs, inactivated poliomyelitis vaccine (IPV) should be offered to those who have not completed a 3-dose primary course of any polio vaccine, and a single booster dose should be given to those who have previously completed the primary course. An up-to-date list of polio-affected countries is available from the World Health Organization (WHO) Global Polio Eradication Initiative website (www.polioeradication.org). Documented evidence of polio vaccination is not routinely required for travellers under International Health Regulations but may be temporarily recommended in accordance with WHO recommendations in response to new evidence of the spread of wild poliovirus (refer to 'Vaccine administration and documentation' in 3.2.3 *Practical aspects of recommending vaccinations for travellers* above). As international polio epidemiology and any associated travel requirements are subject to change, current recommendations for Australian travellers should be sought from the Australian Government Department of Health website (www.health.gov.au).

Selected vaccines based on travel itinerary, activities and likely risk of disease exposure

Cholera

Cholera vaccination is rarely indicated for most travellers,[8] as the risk of acquiring cholera for travellers in general is very low, provided that general precautions to avoid contaminated food and water are taken. The protective efficacy against *Vibrio cholerae* O1 is high (>80%) among children aged 2–5 years for the initial 4–6 months after 3 doses, but wanes to become insignificant afterwards. For those aged >5 years, protective efficacy is about 78% and 63% for the 1st and 2nd year, respectively, and wanes to become insignificant beyond 2 years after vaccination.[9] The vaccine does not protect against the *V. cholerae* O139 serogroup. It is only indicated for those travellers at considerable risk, such as those working in humanitarian disaster situations. However, since cholera and enterotoxigenic *Escherichia coli* (ETEC) share the same toxin, cholera vaccination does afford some partial short-term protection against ETEC-caused travellers' diarrhoea. The effect lasts only about 3 months, and the overall reduction of travellers' diarrhoea risk would be less than 15%;[10] however, there may be some travellers who would benefit from improved protection against travellers' diarrhoea, including those with achlorhydria and those at increased risk of severe or complicated diarrhoeal disease (refer to 4.1 *Cholera*).

Certification of cholera vaccination has been abandoned globally, and no countries have official entry requirements for cholera vaccination.

Hepatitis A

Hepatitis A vaccine should be recommended to all travellers ≥1 year of age travelling to moderately or highly endemic countries (including all developing countries), except those who are likely to have acquired natural immunity following previous infection (refer to 4.4 *Hepatitis A*). There is no longer any place for the routine use of normal human immunoglobulin to prevent hepatitis A in travellers (refer to 4.4 *Hepatitis A*).

Japanese encephalitis

Vaccination is recommended for travellers spending a month or more in endemic areas in Asia and Papua New Guinea during the JE virus transmission season and should be considered for shorter-term travellers, particularly if travel is during the wet season or anticipated to be repeated, and/or there is considerable outdoor activity and/or staying in accommodation without air conditioning, screens or bed nets (refer to 4.8 *Japanese encephalitis*).

Updated information regarding JE virus activity should be sought from a reputable source prior to travel (for example, *Health information for international travel* [the '*Yellow book*'] published by the US Centers for Disease Control and

Prevention, available at www.cdc.gov/travel/yellowbook.[11] While the overall risk of JE in travellers to JE endemic countries is likely to be low (<1 case per 1 million travellers), the risk is determined by the season of travel, the regions visited, the duration of travel, the extent of outdoor activity and the extent to which mosquito avoidance measures are taken.[12,13]

Meningococcal disease

Up-to-date epidemiological information should be sought to determine the need for meningococcal vaccination in travellers. Quadrivalent meningococcal vaccine (which includes serogroups A, C, W_{135} and Y antigens) is recommended for those who intend travelling to parts of the world where epidemics of meningococcal disease occur, in particular the 'meningitis belt' of sub-Saharan Africa.[14] The Saudi Arabian authorities require that all pilgrims travelling to Mecca (for the Hajj or Umra) have evidence of recent vaccination with the quadrivalent meningococcal vaccine[8] (refer to 3.2.6 *Further information* below). The quadrivalent meningococcal conjugate vaccine (4vMenCV) should be used in preference to the quadrivalent meningococcal polysaccharide vaccine (4vMenPV) (refer to 4.10 *Meningococcal disease*).

Rabies

Travellers to rabies-endemic regions should be advised of the risk of rabies infection, and to avoid close contact with either wild, stray or domestic animals, in particular dogs, cats, monkeys and bats. Travellers should also be aware of the importance of appropriate immediate wound care of all animal bites and scratches (refer to 4.16 *Rabies and other lyssaviruses (including Australian bat lyssavirus)*).

Recommendation for pre-travel (i.e. pre-exposure prophylaxis) rabies vaccination (or, where indicated, booster doses) is based on an assessment of the likelihood of contact and risk of exposure to potentially rabid animals, the access to appropriate healthcare and availability of post-exposure prophylaxis, including rabies immunoglobulin, should there be an at-risk exposure, and the timeliness of such access after exposure. The previous recommendation for pre-exposure prophylaxis based on duration of stay in rabies-endemic areas (i.e. for more than a month) is arbitrary, and most Australian travellers who have required post-exposure prophylaxis have undertaken shorter periods of travel. A lower threshold for recommending rabies pre-exposure prophylaxis should be adopted for children travelling to endemic areas (refer to 4.16 *Rabies and other lyssaviruses (including Australian bat lyssavirus)*). Vaccination against rabies before travel ensures that a safe and efficacious vaccine has been used and simplifies the management of a subsequent exposure because fewer doses of vaccine are needed. It also means that rabies immunoglobulin, which is often extremely expensive, difficult or even impossible to obtain in many developing countries, is not required, and reduces the urgency of post-exposure prophylaxis.

Tick-borne encephalitis

Tick-borne encephalitis (TBE) is caused by a tick-borne RNA flavivirus and may involve the central nervous system. The disease is prevalent in parts of temperate regions of central and northern Europe and across northern Asia. Travellers are at particular risk when hiking or camping in forested areas in endemic regions during the summer months. Safe and effective vaccines are available. Vaccination is recommended only for individuals with a high risk of exposure. Two inactivated TBE vaccine formulations (from Austria and Germany) are available in Europe (based on the European subtype), and two other formulations, based on the Far Eastern subtypes, are available in Russia. There is limited evidence that suggests the Austrian and German vaccines induce cross-protecting immunity against the Far Eastern and Siberian subtypes.[15] While the conventional schedule for completing the primary vaccination course takes 9 to 12 months, accelerated schedules are available (refer to 3.2.6 *Further information* below). While no TBE vaccine is registered in Australia, a small stock of vaccine may be available in Australia for use under the Special Access Scheme.

Tuberculosis

Vaccination with BCG vaccine is generally recommended for tuberculin-negative children <5 years of age who will be staying or living in countries with a high prevalence of tuberculosis for an extended period. There is less evidence of the benefit of vaccination in older children and adults, although consideration should be given to vaccination of tuberculin-negative children ≥5 years but <16 years of age who may be living or travelling for long periods in high-risk countries (defined as having an incidence >40 per 100 000 population) (refer to 4.20 *Tuberculosis*).

For travellers who would require the BCG vaccine, the following precautions need to be considered when scheduling their vaccination visits:

- The BCG vaccine should preferably be given at least 3 months prior to entry into endemic areas.
- Other live viral vaccines (e.g. MMR, varicella or yellow fever) should be administered concurrently or with a minimum 4-week interval from BCG vaccination.
- A 2-step tuberculin skin test (Mantoux test), performed by trained and accredited healthcare practitioners, is recommended prior to receiving the BCG vaccine for all individuals except infants aged <6 months.

- Reactivity to tuberculin may be depressed for as long as 4 weeks following viral infections or live viral vaccines, particularly measles infection and measles-containing vaccines.
- Tuberculin skin tests and BCG vaccine are available from state/territory tuberculosis services.

Typhoid

Typhoid vaccine may be recommended to travellers ≥2 years of age travelling to endemic regions, including the Indian subcontinent, most Southeast Asian countries and several South Pacific nations, including Papua New Guinea. This advice is also relevant for those travelling (back) to endemic regions to visit friends and relatives (VFR travel). Inactivated parenteral or live oral typhoid vaccine formulations are available (refer to 4.21 *Typhoid*).

Yellow fever

The yellow fever vaccine is recommended for all persons ≥9 months of age travelling to, or living in, an area with a risk of yellow fever virus transmission (refer to 4.23 *Yellow fever*).[3] To minimise the risk of yellow fever introduction, some countries require documented evidence of yellow fever vaccination for entry, in accordance with the International Health Regulations (refer to 3.2.3 *Practical aspects of recommending vaccinations for travellers*).

The risk of being infected with the yellow fever virus, country entry requirements, and individual factors like age, pregnancy and underlying medical conditions must be taken into account when considering yellow fever vaccination. Vaccination is generally not recommended when travelling to areas where there is low potential for yellow fever virus exposure (i.e. no human yellow fever cases ever reported and evidence to suggest only low levels of yellow fever virus transmission in the past). However, vaccination might be considered for a small subset of travellers to these areas who are at increased risk of exposure to mosquitoes or unable to avoid mosquito bites.[3] People aged ≥60 years are at increased risk of severe adverse events after primary yellow fever vaccination. Vaccination of persons in this age group should be weighed against the potential for yellow fever virus exposure and, in turn, the benefits of vaccination[16] (refer to 4.23 *Yellow fever*).

In most individuals, a booster dose is not required as a single dose of yellow fever vaccine induces protective antibody levels that persist for many decades. However, there are certain individuals for whom a booster is recommended if 10 years have passed since their last dose and they are at ongoing risk of yellow fever infection (refer to 4.23 *Yellow fever*).

Table 3.2.1: Dose and routes of administration of commonly used vaccines in adult travellers (the lower age limit for the adult dosage varies with individual vaccines – please refer to the product information)

Vaccine (adults)	Brand name	Dose (adults)	Route	Dosing intervals	Duration of immunity and/or booster recommendations
Routinely recommended vaccines (not specifically related to travelling overseas)					
Diphtheria-tetanus (dT)	ADT Booster	0.5 mL	IM	A primary course is 3 doses of dT-containing vaccine, given a minimum of 4 weeks apart; followed by booster doses 10 and 20 years after.	Prior to travel, adults should receive a booster dose of dT (or dTpa if not given previously), if more than 10 years have elapsed since their last dose of dT-containing vaccine. For persons undertaking high-risk travel, consider giving a booster dose of either dTpa or dT (as appropriate) if more than 5 years have elapsed since their last dose of dT-containing vaccine.
Diphtheria-tetanus-pertussis (dTpa)	Boostrix or Adacel	0.5 mL	IM		
Diphtheria-tetanus-pertussis-inactivated poliomyelitis (dTpa-IPV)	Boostrix-IPV or Adacel Polio	0.5 mL	IM		
Hepatitis B	Engerix-B	1.0 mL	IM	0, 1, 6 months or 0, 1, 2, 12 months or 0, 7, 21 days and 12 months*	A completed series probably gives life-long immunity.
	H-B-Vax II	1.0 mL	IM	0, 1, 6 months	
Influenza (seasonal)	Various	0.5 mL	IM	Single dose	As different strains circulate from year to year, annual vaccination with the current formulation is necessary.
Measles-mumps-rubella	Priorix	0.5 mL	SC/IM	Australians born during or since 1966 who do not have documented evidence of having received 2 doses of measles-, mumps- and rubella-containing vaccine should receive at least 1 dose of MMR vaccine before travel	A 2-dose schedule provides long-lasting immunity.
	M-M-R II	0.5 mL	SC		
Pneumococcal	Prevenar 13 or Pneumovax 23	0.5 mL	IM	Single dose, for older adults, and younger adults with predisposing medical conditions – refer to 4.13 *Pneumococcal disease*	Recommendations vary according to age, Indigenous status and predisposing conditions – refer to 4.13 *Pneumococcal disease*.
Poliomyelitis	IPOL	0.5 mL	SC	For unvaccinated adults, 3 doses with minimum interval of 1 to 2 months between doses	A booster dose 10-yearly is only necessary if travelling to a poliomyelitis endemic country.
	Combination vaccines (dTpa-IPV)	Refer to Diphtheria-tetanus-pertussis-inactivated poliomyelitis (dTpa-IPV) above and 4.14 *Poliomyelitis*.			
Varicella (chickenpox)	Varilrix or Varivax Refrigerated	0.5 mL	SC	If there is a lack of reliable history of chickenpox or the person is non-immune, and has not been vaccinated in childhood 0, 4 weeks if aged ≥14 years	A 2-dose schedule provides long-lasting immunity.

Selected vaccines based on travel itinerary, activities and likely risk of disease exposure					
Hepatitis A	Avaxim	0.5 mL	IM	0, 6–12 months	A completed series probably gives life-long immunity.
	Havrix 1440	1.0 mL	IM	0, 6–12 months	
	Vaqta Adult formulation	1.0 mL	IM	0, 6–18 months	
Hepatitis A/B combined	Twinrix (720/20)	1.0 mL	IM	0, 1, 6 months or 0, 7, 21 days and 12 months*	A completed series probably gives life-long immunity to both hepatitis A and B.
Hepatitis A/typhoid combined	Vivaxim† *Note:* Only for use in persons ≥16 years of age	1.0 mL (mixed vaccine)	IM	Single dose	A dose of monovalent hepatitis A vaccine given 6–36 months later probably gives life-long immunity. The duration of protection against typhoid is probably 3 years.
Japanese encephalitis	The vaccine brand and doses required, including booster doses, depend on the age at which the vaccine course is commenced and other factors (refer to 4.8 *Japanese encephalitis*).				
Meningococcal $ACW_{135}Y$ (quadrivalent conjugate 4vMenCV)‡	The vaccine brand and doses required, including booster doses, depends on the age at which the vaccine course is commenced and other factors (refer to 4.10 *Meningococcal disease*).				
Rabies (pre-exposure prophylaxis)	Mérieux Inactivated Rabies Vaccine	1.0 mL	IM/SC	0, 7, 21–28 days	Boosters are not recommended for frequent travellers unless they are at ongoing, high occupational risk of exposure – then either measure rabies antibody titres (and boost if titres are reported as inadequate) or give a single booster dose 2-yearly.
	Rabipur Inactivated Rabies Virus Vaccine	1.0 mL	IM	0, 7, 21–28 days	
Typhoid	Vivotif Oral	A single oral capsule per dose	Oral	One capsule each on days 1, 3, 5 (3-dose course), and preferably also day 7§ (4-dose course)	If the person is at ongoing risk, repeat the course after 3 years if a 3-dose course was given initially; repeat the course after 5 years if a 4-dose course was given initially.
	Typherix or Typhim Vi	0.5 mL	IM	Single dose	Give 3-yearly boosters if the person is at ongoing risk.
Yellow fever	Stamaril	0.5 mL	IM/SC	Single dose	A 10-yearly booster dose is only recommended for: – certain persons (i.e. those who received their initial dose while pregnant or when infected with HIV, and those at high risk of infection due to travel or occupation) if they are at ongoing risk of yellow fever virus infection – travellers who need to meet country-specific vaccination entry requirements. Refer to 4.23 *Yellow fever*.

* This 'rapid' schedule should be used only if there is very limited time before departure to endemic regions.

† Vivaxim is registered for use in persons aged ≥16 years.

‡ 4vMenCV is preferred. However, 4vMenPV is a suitable alternative for travellers aged ≥7 years when the need for repeat doses is not anticipated (refer to 4.10 *Meningococcal disease*).

§ A 4th capsule of oral typhoid vaccine on day 7 is preferred (refer to 4.21 *Typhoid*).

3.2.5 Vaccinating the traveller with special risk factors

Refer to 3.3 *Groups with special vaccination requirements* and the disease-specific chapters in Part 4 for recommendations for travellers who are either pregnant or immunocompromised.

Children should receive relevant travel vaccines, according to age-specific dosage and schedules as shown in Table 3.2.2; further information relating to administration is provided in the relevant disease-specific chapters in Part 4.

Particular effort should be made to encourage the families of recent migrants to Australia to seek health advice before travelling to their country of origin to visit relatives and friends.[17]

Table 3.2.2: Recommended lower age limits of travel vaccines for children*

Vaccine	Lower age limit	Dose/route	Dosing intervals
Hepatitis A			
Avaxim	2 years	0.5 mL IM	2 doses: 0 and 6–12 months
Havrix Junior	2 years	0.5 mL IM	2 doses: 0 and 6–12 months
Vaqta Paediatric/Adolescent formulation	1 year	0.5 mL IM	2 doses: 0 and 6–18 months
Hepatitis A/B combined			
Twinrix Junior (360/10)	1 year	0.5 mL IM	3 doses: 0, 1 and 6 months
Twinrix (720/20)	1 year	1.0 mL IM	2 doses: 0 and 6–12 months†
Japanese encephalitis			
JEspect	2 months (to <3years)‡	0.25 mL IM	2 doses: 0 and 28 days
	3 years‡	0.5 mL IM	2 doses: 0 and 28 days
Imojev	9 months§	0.5 mL SC	Single dose
Meningococcal $ACW_{135}Y$ (quadrivalent conjugate 4vMenCV)			Varies by age at time of vaccination and vaccine brand. Refer to Table 4.10.3 in 4.10 *Meningococcal disease*
Menveo	2 months	0.5 mL IM	
Menactra	2 years	0.5 mL IM	
Nimenrix	12 months	0.5 mL IM	
Meningococcal $ACW_{135}Y$ (quadrivalent polysaccharide 4vMenPV)			
Mencevax ACWY	7 years¶	0.5 mL SC	Single dose
Menomune	7 years¶	0.5 mL SC	Single dose
Rabies			Pre-exposure:
Mérieux Inactivated Rabies Vaccine	No lower age limit	1.0 mL IM/SC	3 doses: 0, 7, 21–28 days
Rabipur Inactivated Rabies Virus Vaccine	No lower age limit	1.0 mL IM	3 doses: 0, 7, 21–28 days
Typhoid			
Vivotif Oral	6 years	Oral capsule	One capsule each on days 1, 3, 5 (3-dose course), and preferably also day 7# (4-dose course)
Typherix	2 years	0.5 mL IM	Single dose
Typhim Vi	2 years	0.5 mL IM	Single dose
Yellow fever			
Stamaril	9 months**	0.5 mL IM/SC	Single dose

* Refer also to minimum ages in Table 2.1.5 *Minimum acceptable age for the 1st dose of scheduled vaccines in infants in special circumstances*.

† This schedule is not recommended if prompt protection against hepatitis B is required (refer to 4.5 *Hepatitis B*).

‡ JEspect can be administered to children aged ≥2 months to<18 years in circumstances where an alternative is not available or is contraindicated (refer to 4.8 *Japanese encephalitis*).

§ Imojev can be administered to persons aged ≥9 months (refer to 4.8 *Japanese encephalitis*).

¶ 4vMenCV is preferred. However, 4vMenPV is a suitable alternative for travellers aged ≥7 years when the need for repeat doses is not anticipated (refer to 4.10 *Meningococcal disease*).

A 4th capsule of oral typhoid vaccine on day 7 is preferred (refer to 4.21 *Typhoid*).

** Yellow fever vaccine is contraindicated in infants <9 months of age. (Vaccination may be considered in outbreak control situations for infants from 6 months of age.) (Refer to 4.23 *Yellow fever*.)

3.2.6 Further information

International travellers' health risks are changing constantly. Up-to-date information and knowledge of the changing epidemiology and occurrence of outbreaks of a variety of infectious and emerging diseases is essential. Useful online information sources include:

- the World Health Organization (WHO) for disease outbreak news (www.who.int), and its *Travel and health* section (www.who.int/topics/travel/en) for more specific advice on travel and health, including travel vaccination recommendations
- *Travelers' health* section of the United States Centers for Disease Control and Prevention (CDC) website (wwwnc.cdc.gov/travel)
- *Travel health and quarantine* section of the Australian Government Department of Health website (www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-quaranti-index.htm)
- *Smartraveller* – the Australian Government's travel advisory and consular information service, which provides up-to-date advice regarding health, safety and other risks of specific destinations to Australian travellers (www.smartraveller.gov.au).

Comprehensive technical advice on international travel and health, including but not limited to vaccinations, is available in the latest editions of the WHO publication *International travel and health* (available at www.who.int/ith/en) and the US Centers for Disease Control and Prevention (CDC) publication *Health information for international travel* (the '*Yellow book*') (available at www.cdc.gov/travel).

The Ministry of Health of Saudi Arabia's requirements and recommendations for travellers on pilgrimage to Mecca (Hajj and Umra) are published annually in the *Weekly Epidemiological Record* of the WHO (www.who.int/wer).[8]

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A full reference list is available on the electronic *Handbook* or website www.immunise.health.gov.au

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